Claims

[c1]   1. A method of testing and repairing an integrated circuit having a total number of fuses for effecting repair of said integrated circuit, comprising:
testing a memory array with a set of tests and reserving a first number of said total number of fuses for use in repairing said memory array based on results of said first set of tests; and
shmoo testing said memory array by incrementing, decrementing or incrementing and decrementing values of a test parameter until a minimum or maximum value of said test parameter is reached that utilizes a second number of said total number of fuses for use in repairing said memory array to operate at said minimum or maximum value of said test parameter.

[c2]   2. The method of claim 1, wherein said first number of fuses plus said second number of fuses equal said total number of fuses or said first number of fuses plus said second number of fuses equal said total number of fuses minus a predetermined number of fuses.

[c3]   3. The method of claim 1, further including:
collecting fuse data based on said testing a memory ar-

ray with a set of tests; and

collecting fuse data based on said shmoo testing.

[c4]   4. The method of claim 3, further including:

programming said fuses to effect repair of said memory
array based on said fuse data based on said testing said
memory array with said set of tests and based on said
fuse data based on said shmoo testing.

[c5]   5. The method of claim 1, wherein said test parameter is
the minimum specified operating voltage of said memory
array.

[c6]   6. The method of claim 1, further including:

repairing said memory array based on results of said
first set of tests by replacement of one or more word-
lines in said memory array with one or more redundant
wordlines; and

repairing said memory array to operate at said minimum
or maximum value of said test parameter by replacement
of one or more wordlines in said memory array with one
or more redundant wordlines.

[c7]   7. The method of claim 1, wherein said incrementing,
decrementing or incrementing and decrementing values
of a test parameter until a minimum or maximum value
of said test parameter is reached comprises a linear or

binary process.

[c8]   8. The method of claim 1, wherein said memory array comprises static random access memory cells or dynamic random access memory cells.

[c9]   9. The method of claim 1, wherein said memory array is an embedded memory array.

[c10]   10. A method of testing and repairing an integrated circuit having a total number of fuses for effecting repair of said integrated circuit, comprising:
(a) selecting an integrated circuit chip on a wafer for testing;
(b) selecting a test parameter for shmoo testing;
(c) testing a memory array on said selected integrated circuit with a set of tests and reserving a first number of said total number of fuses for use in repairing said memory array based on results of said first set of tests;
(d) shmoo testing said memory array by incrementing, decrementing or incrementing and decrementing values of a test parameter until a minimum or maximum value of said test parameter is reached that utilizes a second number of said total number of fuses for use in repairing said memory array to operate at said minimum or maximum value of said test parameter;
(e) saving said first and second sets of fuse data; and

(f) repeating steps (a) through (e) until all integrated circuit chips on said wafer have been selected.

[c11]   12. The method of claim 10, wherein said first number of fuses plus said second number of fuses equal said total number of fuses or wherein said first number of fuses plus said second number of fuses equal said total number of fuses minus a predetermined number of fuses.

[c12]   12. The method of claim 10, wherein a number of times said test parameter is incremented or decremented is limited to a predetermined number of times even if said minimum or maximum value of said test parameter is not reached.

[c13]   13. The method of claim 10, further including:
(g) programming said fuses to effect repair of said memory array based on said fuse data based on said testing said memory array with said set of tests and based on said fuse data based on said shmoo testing.

[c14]   14. The method of claim 10, further including:
between steps (c) and (d), programming said fuses to effect repair of said memory array based on said fuse data based on said testing said memory array with said set of tests; and
after step (d), programming said fuses to effect repair of

said memory array based on said fuse data based on said shmoo testing.

[c15]   15. The method of claim 10 further including:
(g) repairing said memory array based on results of said first set of tests by replacement of wordlines in said memory array with redundant wordlines; and
(h) repairing said memory array to operate at said minimum or maximum value of said test parameter by replacement of wordlines in said memory array with redundant wordlines.

[c16]   16. The method of claim 10, wherein said incrementing, decrementing or incrementing and decrementing values of a test parameter until a minimum or maximum value of said test parameter is reached comprises a linear or binary process.

[c17]   17. The method of claim 10, wherein said test parameter is the minimum specified operating voltage of said memory array.

[c18]   18. The method of claim 10, wherein said memory array comprises static random access memory cells or dynamic random access memory cells.

[c19]   19. The method of claim 10, wherein said memory array is an embedded memory array.

[c20]   20. The method of claim 10, further including between steps (b) and (c) not performing any test in step (c) that test said memory array to a parameter that is the same as said test parameter selected in step (b).